1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Identification of the substance/preparation:

<table>
<thead>
<tr>
<th>Trade name</th>
<th>DICHLOROPROPANE- TECHNICAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUPAC name</td>
<td>1,2-Dichloropropane</td>
</tr>
<tr>
<td>Synonym</td>
<td>propylene dichloride; PDC; dichloropropane; DCP</td>
</tr>
<tr>
<td>EC#</td>
<td>201-152-2</td>
</tr>
<tr>
<td>CAS #</td>
<td>78-87-5</td>
</tr>
<tr>
<td>Nr. Index</td>
<td>602-020-00-0</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C3H6Cl2</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>112.99</td>
</tr>
<tr>
<td>REACH Registration number</td>
<td>01-2119557878-16-0000</td>
</tr>
<tr>
<td>Chemical characterisation</td>
<td>Organic substance, monoconstituent</td>
</tr>
</tbody>
</table>

1.2. Relevant identified uses of the substance or mixture and uses advised against

**Uses by workers in industrial settings**
Use in solvent-based degreasers and cleaning products
Use as solvent/thinner for painting products/inks
Use as solvent for glues and adhesives
Use as stain remover for fabrics
Use as paint remover
Use as intermediate

**Uses by professional workers**
Use in solvent-based degreasers and cleaning products
Use as solvent/thinner for painting products
Use as solvent for glues and adhesives
Use as stain remover for fabrics
Use as paint remover

**Uses by consumers**
Use in solvent-based degreasers and cleaning products
Use as solvent/thinner for painting products
Use as solvent for glues and adhesives
Use as stain remover for fabrics
Use as paint remover
1.2 DICHLOROPROPANE - Technical Grade

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Uses advised against
The use as active substance in plant protection products is forbidden, according to Directive 91/414/EEC.

1.3. Details of the supplier of the safety data sheet

<table>
<thead>
<tr>
<th>Name</th>
<th>S.C. OLTCHIM S.A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>1 Uzinei Street, 240050 Ramnicu Valcea, Romania</td>
</tr>
<tr>
<td>Phone N°</td>
<td>+40 250 701 200</td>
</tr>
<tr>
<td>FAX N°</td>
<td>+40 250 735 030</td>
</tr>
<tr>
<td>E-mail of competent person responsible for SDS in the MS or in the EU:</td>
<td><a href="mailto:tehnic@oltchim.com">tehnic@oltchim.com</a></td>
</tr>
</tbody>
</table>

1.4 Emergency telephone

<table>
<thead>
<tr>
<th>European Emergency N°:</th>
<th>112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency telephone at the company:</td>
<td>+40/250/738141- available 24h/day/365days</td>
</tr>
</tbody>
</table>

For Romania- The institution responsible with providing information in case of a health emergency is The National Institute for Public Health, Department for the International Sanitary Regulation and Toxicological Information.

| Telephone: | 021.318.36.20/extension 235, |
| Working hours: | Monday - Friday from 8 a.m. to 3 p |

2. HAZARD IDENTIFICATION

2.1. Classification of the substance, according to Regulation 1272/2008, CLP

Flam. Liq.2- H 225 Highly flammable liquid and vapour.
Acute tox.4-H 302 Harmful if swallowed.
Acute tox.4-H 332 Harmful if inhaled.
Carc. 1B H350: May cause cancer. (the classification as carc categ. 1B is due the presence of epichlorohydrin, as impurities, in amount of max 0.3%)

2.2. Label elements- Labeling according to Regulation 1272/2008

Labeling according to Regulation 1272/2008

<table>
<thead>
<tr>
<th>Signal Word</th>
<th>DANGER</th>
</tr>
</thead>
</table>

This information only concerns the above mentioned product and does not need to be valid if used with other product(s) or in any process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this product.

Cod: FDS 011
**SAFETY DATA SHEET**
Prepared in accordance with Annex II of the REACH regulation EC 1907/2006, and Regulation 453/2010

**1,2 DICHLOROPROPANE-Technical Grade**

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<table>
<thead>
<tr>
<th>GHS Pictograms</th>
<th><img src="image" alt="Flame" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>GHS02 Flame</td>
<td></td>
</tr>
<tr>
<td>GHS07: exclamation mark</td>
<td><img src="image" alt="Exclamation Mark" /></td>
</tr>
<tr>
<td>GHS02: health hazard</td>
<td><img src="image" alt="Health Hazard" /></td>
</tr>
</tbody>
</table>

**HAZARD STATEMENTS**

<table>
<thead>
<tr>
<th>Hazard phrases</th>
<th>H 225 Highly flammable liquid and vapour.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H 302 Harmful if swallowed.</td>
</tr>
<tr>
<td></td>
<td>H 332 Harmful if inhaled.</td>
</tr>
<tr>
<td></td>
<td>H350: May cause cancer.</td>
</tr>
</tbody>
</table>

**PRECAUTIONARY STATEMENTS**

<table>
<thead>
<tr>
<th>Precautionary Statement</th>
<th>P210: Keep away from heat/sparks/open flames/... /hot surfaces.... No smoking.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P241: Use explosion-proof electrical/ventilating/lighting/... / equipment.</td>
</tr>
<tr>
<td></td>
<td>P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.</td>
</tr>
<tr>
<td></td>
<td>P260: Do not breathe dust/fume/gas/mist/vapours/spray.</td>
</tr>
<tr>
<td></td>
<td>P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.</td>
</tr>
<tr>
<td></td>
<td>P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.</td>
</tr>
<tr>
<td></td>
<td>P280: Wear protective gloves/protective clothing/eye protection/face protection.</td>
</tr>
</tbody>
</table>

**Other information:** 1,2-Dichloropropane is a highly flammable liquid. Vapor/air mixtures are explosive. Contact with strong oxidizers may cause fire.

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Cod: FDS 011
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>PBT/vPvB</th>
<th>CAS no/EC No/REACH No.</th>
<th>Classification according to Reg (EC) No. 1272/2008</th>
<th>Concentration, % (w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2-Dichloropropane</td>
<td>No/No</td>
<td>78-87-5/201-152-2/01-2119557878-16-0000</td>
<td>Flam. Liq H225 Acute tox. 4 H302, H332</td>
<td>min.99</td>
</tr>
</tbody>
</table>

Chemical identification of the impurities

| Epichlorhydrde (1-chloro-2,3-epoxypropane) | No/No | 106-89-8/203-439-8 | Flam. Liq. 3-H226 Carc. 1B-H350 Acute Tox. 3 (*)-H331 Acute Tox. 3 (*)-H311 Acute Tox. 3 (*)-H301 Skin Corr. 1B-H314 Skin Sens. 1-H317 | Max.0.3 |

Impurities: 1,2-DCP contain no other impurities relevant for classification and labelling.

4. FIRST-AID MEASURES

4.1 Description of first aid measures

General Advice: IF exposed or if you feel unwell: Call a Poison Center or doctor/physician. Show this safety data sheet to the doctor in attendance.

If Inhaled: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Call a physician.

In case of skin contact: Wash the contaminated skin with plenty of soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. If irritation persists after washing, get medical attention.

In case of eye contact: Wash the eyes immediately with large amount of water lifting the upper and lower lids. If irritation persists after washing get medical attention. Contact lenses should not worn with this product.
In case of ingestion: Never give anything by mouth to an unconscious person. If victim is conscious give plenty of water to drink in order to dilute the content of stomach, also give activated charcoal (20-40g in 10% slurry), paraffin oil (3ml/kg) and sodium sulfate (1tablespoon/1/4 l water). Do not induce vomiting. Keep the airway clear. Get medical attention immediately.

4.2. Most important symptoms and effects, both acute and delayed

By inhalation: Irritating to the respiratory tract. May cause headache, weakness, cyanosis, cyanosis, nausea vomiting and diarrhea. These symptoms may be followed by central nervous system effects, liver and kidney damage adrenal gland damage, weak and rapid pulse and unconsciousness.

By eye contact: Vapor cause irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

By skin contact: Causes irritation, rash and blister formation. Skin contact may produce a burning sensation.

By ingestion: Cause abdominal pain, nausea, diarrhea, headache and dizziness.

Chronic effect: Affects central nervous system, liver and kidneys.

4.3 Indication of immediate medical attention and special treatment needed

Note to Physician: Gastric lavage

5. FIRE - FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: Dry chemical, foam or carbon dioxide.

Unsuitable extinguishing media: Do not use a solid stream of water, since the stream will scatter and spread the fire. Water spray may be used to keep fire-exposed containers cool.

5.2 Special hazards arising from the substance or mixture

Exposure hazards: 1,2-Dichloropropane is a highly flammable liquid. Vapor/air mixtures are explosive at ambient temperatures. Contact with strong oxidizers may cause fire. Toxic vapors of phosgene, carbon monoxide and hydrogen chloride are emitted on combustion. Explosive limit: 3,4 – 14,5 % vol.

Hazardous combustion products: Thermal decomposition or combustion may generate toxic and hazardous fumes of COx, HCl.
5.3 Advice for firefighters

**Special precautions for fire-fighters:** Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

**Protection of fire-fighters:** Self-contained breathing apparatus, flame and chemical resistant clothing, boots and gloves.

**Remarks:** Move containers from fire area if it can be done without risk. Water spray may be used to dilute spills to non flammable mixture, protect personnel attempting to stop leak and disperse vapors.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel:** Keep unnecessary and unprotected personnel away from entering. Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8). Do not touch or walk through spill material. Shut off all ignition sources.

**For emergency responders:** Ventilate area of leak or spill. Persons performing clean-up work should wear adequate personal protective equipment and a self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Keep unnecessary and unprotected personnel from entering. Remove all sources of ignition.

6.2. Environmental precautions

Stop leak and use water spray to reduce vapors. Do not let the product enter drainage system, surface and ground-water or soil. Contact local authorities in case of environmental release. Do not empty into drains.

6.3. Methods and materials for containment and cleaning up

**Methods of cleaning up:** Stop leak and use water spray to reduce vapors. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (vermiculite, dry sand, earth) and place in a chemical waste container. Send to the storage waiting for disposal procedures.
SAFETY DATA SHEET
Prepared in accordance with Annex II of the REACH regulation EC 1907/2006, and Regulation 453/2010

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Special precautions: Do not use combustible materials, such as saw dust. Do not flush to sewer!
Use only non sparkling tools and equipment.

7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Handling and Transfer Measures:
Do NOT use compressed air for filling, discharging or handling operations. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge. The vapour is heavier than air, spreads along the ground and distant ignition is possible. If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve. Use explosion-proof electrical/ventilating/ lighting and other equipment. Use appropriate equipment for filling containers. Containers must be constructed of appropriate material. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Handle and open container with care in a well-ventilated area. Avoid Overfilling. Do NOT empty into drains. Use only with adequate ventilation. Avoid all possible sources of ignition (spark or flame). Do not puncture or incinerate container.

Advice on general occupational hygiene: Avoid inhalation or ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no drinking, eating and smoking at the workplace. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home.

Storage: Must be stored in a dike (bundled) and well-ventilated area, away from sunlight, ignition sources and other sources of heat. Store DCP under nitrogen blanket and storage temperature should not exceed 20°C. Keep away from flames, sources of ignition and hot surfaces. No smoking. Take precautionary measures against static discharges. Keep container in a well-ventilated place. Keep container tightly closed

Incompatible substance: Keep away from strong oxidizers, strong acids and finely divided metals.

\[\text{OLTCHIM}\]

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SAFETY DATA SHEET
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Incompatible materials: aluminum.

7.3. Specific end use(s)
Please check the identified uses from Section 1.2.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters
PNEC aqua (freshwater): 8.2 x 10^{-2}mg/L
PNEC aqua (marine water): 8.2 x 10^{-2}mg/L
PNEC aqua (intermittent releases): 2.7 x 10^{-2}mg/L
PNEC sediment (freshwater): 1.57 x 10^{-1}mg/kg sediment dw
PNEC sediment (marine water): 1.57 x 10^{-2}mg/kg sediment dw
PNEC STP: 0.53 mg/L
PNEC soil: 2.84 x 10^{-2}mg/kg soil dw

DNELs for workers

<table>
<thead>
<tr>
<th>Exposure pattern</th>
<th>Route</th>
<th>Descriptors</th>
<th>DNEL/DMEL (appropriate unit)</th>
<th>Most sensitive endpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute - systemic effects (x Factor 2)</td>
<td>dermal (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>2.07 mg/kg/day</td>
<td>Acute Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m^3)</td>
<td>NOAEC = 693 mg/m^3</td>
<td>57.75 mg/m^3</td>
<td>Acute Inhalation exposure</td>
</tr>
<tr>
<td>Acute - local effects</td>
<td>Dermal (mg/cm^2)</td>
<td>NOAEL = 83.3 mg/cm^2</td>
<td>1.39 mg/cm^2</td>
<td>Acute Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m^3)</td>
<td>NOAEC = 693 mg/m^3</td>
<td>57.75 mg/m^3</td>
<td>Acute exposure</td>
</tr>
<tr>
<td>Long-term - systemic effects</td>
<td>Dermal (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>1.03 mg/kg/day</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m^3)</td>
<td>NOAEC = 693 mg/m^3</td>
<td>28.88 mg/m^3</td>
<td>Prolonged exposure</td>
</tr>
<tr>
<td>Long-term – local effects</td>
<td>Dermal (mg/cm^2)</td>
<td>NOAEL = 83.3 mg/cm^2</td>
<td>1.39 mg/cm^2</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m^3)</td>
<td>NOAEC = 693 mg/m^3</td>
<td>-</td>
<td>Prolonged exposure</td>
</tr>
</tbody>
</table>

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Cod: FDS 011
### SAFETY DATA SHEET
Prepared in accordance with Annex II of the REACH regulation EC 19007/2006, and Regulation 453/2010

### 1,2 DICHLOROPROPANE-Technical Grade

#### DNELs for general population

<table>
<thead>
<tr>
<th>Exposure pattern</th>
<th>Route</th>
<th>Descriptors</th>
<th>DNEL/DMEL (appropriate unit)</th>
<th>Most sensitive endpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute - systemic effects (x Factor 2)</td>
<td>Dermal (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>1.03 mg/kg/day</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m³)</td>
<td>NOAEC = 693 mg/m³</td>
<td>28.88 mg/m³</td>
<td>Acute exposure</td>
</tr>
<tr>
<td></td>
<td>Oral (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>2.29 mg/kg/day</td>
<td>Ingestion</td>
</tr>
<tr>
<td>Acute - local effects</td>
<td>Dermal (mg/cm²)</td>
<td>NOAEL = 83.3 mg/cm²</td>
<td>0.67 mg/cm²</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m³)</td>
<td>NOAEC = 693 mg/m³</td>
<td>28.88 mg/m³</td>
<td>Acute exposure</td>
</tr>
<tr>
<td>Long-term - systemic effects</td>
<td>Dermal (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>0.52 mg/kg/day</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m³)</td>
<td>NOAEC = 693 mg/m³</td>
<td>14.44 mg/m³</td>
<td>Prolonged exposure</td>
</tr>
<tr>
<td></td>
<td>Oral (mg/kg bw/day)</td>
<td>NOAEL = 62 mg/kg/day</td>
<td>0.52 mg/kg/day</td>
<td>Ingestion</td>
</tr>
<tr>
<td>Long-term – local effects</td>
<td>Dermal (mg/cm²)</td>
<td>NOAEL = 83.3 mg/cm²</td>
<td>0.69 mg/cm²</td>
<td>Skin contact</td>
</tr>
<tr>
<td></td>
<td>Inhalation (mg/m³)</td>
<td>NOAEC = 693 mg/m³</td>
<td>-</td>
<td>Acute exposure</td>
</tr>
</tbody>
</table>

#### 8.2. Control parameters

**Exposure limits**  
OSHA PEL (permissible exposure limit)  
75 ppm.

**Engineering control:** LEV (local exhaust ventilation)  
A system of local and/or general exhaust is recommended to keep employee exposure as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its sources, preventing dispersions of it into the general work area. Ventilation equipment should be explosion-proof if explosive concentration of vapors or fumes are present.

**Personal protective equipment:** gloves, safety glasses, coveralls, safety shoes.

**Respiratory protection:** If the exposure limit is exceeded, wear a supplied air, full-face piece self contained breathing apparatus.
SAFETY DATA SHEET
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Regulation 453/2010

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Warning! Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Hand protection: The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).

Eye / Face protection: Use chemical safety goggles and/or a full face shield when is possible. Avoid using contact lenses at work. The working area will be equipped with eyewash fountains.

Skin protection: Wear impervious protective clothing including boots, lab coat, apron or coveralls as appropriate to prevent skin contact. All protective clothing (suits, gloves, footwear, headgear) contaminated by 1,2-dichloropropane may clean promptly. Do not take contaminated work clothes home, family members could be exposed.

Environmental Exposure Control: It is recommendable to develop a monitoring plan in order to maintain the releases in the environment below the maximum allowed concentrations, complying with local, regional, national and national legislation.

Other precautions: Maintain shower, eye wash fountain and quick-drench facilities in work area.

9. PHYSICAL AND CHEMICAL PROPERTIES

General informations
Appearance  Colorless liquid
Odor  Chloroform-like odor.

Important health, safety and environmental informations
pH  NA
Boiling point  95.5-96.5°C
Flash point  21°C (open cup)
13-15°C (close cup)
Flammability  Flammable limits of 1,2-dichloropropane are (at 20°C):
Upper limit: 14.5%
Lower limit: 3.4%
Explosive properties  may form explosive vapor/air mixture

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Cod: FDS 011
1,2 DICHLOROPROPANE - Technical Grade

Oxidizing properties: no oxidizing properties
Explosive limits in air: 3.4-14.5%.

Vapor pressure: 49.67 mmHg at 25°C

Specific gravity: 1.16 g/cm³ at 20°C

Solubility - water: 2.7 g/l at 20°C
Solubility - organic solvents: miscible with most common solvents

Partition coefficient (log K_{ow}): 2

Vapor density (air=1): 3.9

Relative density of the vapor/air mixture (air=1): 1.15 at 20°C

Viscosity: 0.757 cSt at 20°C

Density: 1.15 g/cm³

Other information:

Melting point: -100°C
Autoignition temperature: 555-600°C

10. STABILITY AND REACTIVITY

10.1. Reactivity: See section 10.5.

10.2. Chemical stability: Stable under ordinary conditions of use and storage.

10.3. Possibility of hazardous reactions:
Avoid contact with acids, bases, alkali metals, alkaline earth metals, aluminum, powdered metals, amides.

10.4. Conditions to avoid: Heat, sparks, electric equipment & open flame.

10.5. Incompatible materials: aluminum, powdered metals.

Materials to avoid: acids, bases, alkali metals, alkaline earth metals, aluminum, finely powdered metals, amides.

Hazardous decomposition products: Emits toxic fumes of hydrogen chloride, phosgene, acetylene and vinyl chloride when heated to decomposition.

11. TOXICOLOGICAL INFORMATION
# SAFETY DATA SHEET

Prepared in accordance with Annex II of the REACH regulation EC 1907/2006, and Regulation 453/2010

**1,2 DICHLOROPROPANE-Tech nical Grade**

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<table>
<thead>
<tr>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absorption</strong></td>
</tr>
<tr>
<td>The results of studies demonstrated rapid absorption, metabolism, and excretion irrespective of the route of exposure. Urine was the principle route of elimination (accounting for 40-65% of recovered radioactivity), followed by expired air (20-40% of recovered radioactivity).</td>
</tr>
<tr>
<td><strong>Acute toxicity</strong></td>
</tr>
</tbody>
</table>
| **Oral route:**  
Rat: LD50 2200 mg/kg bw (males/femals) (OECD SIDS 2003a) |
| **Inhalation route:**  
Rat, LC50 (4h): 2000 ppm (9.400 mg/L) by a conversion factor of 1 ppm = 4.7 mg/L (male/female); (OECD SIDS 2003a) |
| **Dermal route:**  
Rabbit, LD50: 10100 mg/kg bw (male); (OECD SIDS 2003a) |
| **Irritation/Corrosion** |
| **Skin**  
Slightly irritating to rabbit (semioclusive); according to OECD Guideline 404 minimal redness and slight edema appear |
| **Eye**  
Moderately irritating to Isolated Chicken Eyes; according to Oecd Guidelines 438 redness, swelling, and slight opacity may appear. |
| **Sensitisation** |
| 1,2-dichloropropane, is not a sensitizer to skin. |
| **Repeated dose toxicity** |
| **Oral route (dietary)**  
rat (Fischer 344) male/female, exposure: 103 wk (5 d/wk) NOAEL: 62 — 125 mg/kg bw (total dose) LOAEL: 125 — 250 mg/kg bw (total dose) Systemic effects observed. |
| **Dermal route**  
study scientifically unjustified |
| **Inhalation route** |
| rabbit (male/female), exposure 13 weeks of exposure (6 hr/d, 5 d/wk) |

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| Mutagenicity                  | LOAEL: 150 ppm males (693 mg/m³) |
|                              | NOAEL: 150 ppm females (693 mg/m³) |

**Carcinogenity**
Due to the lack of a carcinogenic potential of 1,2-dichloropropane, there is currently no need for classification and labeling.

**Toxicity for reproduction**
Overall these studies provide no evidence that 1,2-dichloropropane selectively targets the male or female reproductive systems or the developing embryo/fetus.

Lowest NOAEL values:
- 70 mg/kg bw/day for fertility
- 150 mg/kg bw for teratogenicity

12. ECOLOGICAL INFORMATION

**Aquatic Toxicity**

**Short-term toxicity to fish**
*Pimephales promelas/Fresh water/ flow-through*  
LC50 (96 h) = 139 mg/L

**Long-term toxicity to fish**
*Pimephales promelas NOEC (28 d): 6 — 11 mg/L*

**Short-term toxicity to aquatic invertebrates**
*Daphnia/semi-static*  
EC50 (24 h): 3.8 mg/L  
EC50 (48 h): 2.7 mg/L

**Long-term toxicity to aquatic invertebrates**:  
*Mysisopsis bahia (new name: Americamysis bahia)/fresh water*  
EC10/LC10 or NOEC: 4.09 mg/L

**Algae and aquatic plants**
*Pseudokirchnerella subcapitata (reported as Selenastrum capricornutum) (algae)/fresh water/static*  
EC50 (72 h): > 7.95 mg/L (NOEC = 7.95 mg/L)

**Toxicity to sediment**
PNEC fresh water sediment $1.57 \times 10^{-1}$ (mg/kg d.w.)
PNEC marine water sediment $1.57 \times 10^{-2}$ (mg/kg d.w.)

**Toxicity to soil macro-organisms**

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Toxicity to terrestrial plants:

In accordance with column 2 of REACH Annex IX, the short term toxicity to plants study does not need to be conducted as direct and indirect exposure of the soil compartment is unlikely. The substance shows a low adsorptive (log Koc = 1.72) as well as a bioaccumulative (log Kow = 1.99 - 2.28, BCF = 0.5 - 7) potential. Hence, a relevant distribution into soil and a considerable exposure of terrestrial plants is not expected.

12.2. Persistence and degradability

Abiotic degradation:
Biodegradation: 1,2-dichloropropene is not inherently biodegradable as only 11.7% of degradation was observed after 28 days.

12.3. Bioaccumulative potential:

Log Pow values were lower than the threshold level of 4.5 as indicated in the PBT assessment guidance, so substance is not considered to bioaccumulate in the aquatic organism.

12.4. Mobility

Air: Even 1,2-dichloropropene is considered to volatise in the atmospheric compartment, the further evaluation did not show any hazard. Photo-oxidation half-life in air, based on estimated rate constant for the vapour phase reaction with hydroxyl radicals in air, is in the range 65 - 646 hr.

Soil and water: 1,2-dichloropropene is not expected to adsorb significantly to organic matter in soil, sediment, or suspended solids in wastewater or surface waters, based on a modelled value for Koc of 68 (Davis, 2004). The low Koc value suggests that 1,2-dichloropropene is expected to have high mobility in soil. The Henry’s Law constant of 274 Pa m³ mol⁻¹ indicates that 1,2-dichloropropene is expected to volatilize from soil and to a much lesser extent from water surfaces.

12.5. Results of PBT and vPvB assessment:

1,2-Dichloropropene does not fulfil the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).
13. DISPOSAL CONSIDERATIONS

This section contains generic advice and guidance.

13.1 Waste treatment methods

13.1.1 Product

Methods of disposal: The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Avoid dispersal of spill material and runoff and contact with soil, waterways, drains and sewers.

Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

European waste codes list: 07 01 03* organic halogenated solvents, washing liquids and mother liquors

13.1.2. Packaging

Methods of disposal: The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions: This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spill material and runoff and contact with soil, waterways, drains and sewers.

Relevant European legislation regarding waste:

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14. TRANSPORT INFORMATION

1,2 Dichloropropane can be shipped according to transport regulations for dangerous goods, hazard class 3, Flammable liquids.

Transport Labeling

![Label no.3 Flammable liquids]

RID/ADR
UN No. 1279
Proper shipping name 1,2 Dichloropropane
Hazard class 3
UN Packing Group II
Classification code F1

Danger panel 33/1279
(Hazard Identification No. 33)
(UN Identification No 1279)

IMDG/IMO
UN No. 1279
Hazard class 3
UN Packing Group II
Proper shipping name 1,2 Dichloropropane
EmS No. F-E, S-D
Marine pollutant No

IATA/IT-ICAO
Proper shipping name 1,2 Dichloropropane
UN No. 1279
Hazard class 3
UN Packing Group II
IATA Label Flammable Liquid
Passenger and cargo: (LIMITED QUANTITY) P.I.: Y341; max net q.ty per pack: 1 L;
Passenger and cargo: P.I.: 353; max net q.ty per pack: 5 L;
Cargo only: P.I.: 364; max net q.ty per pack: 60L.
Special provision: 3H.

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15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
Relevant information regarding the European legislation
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)
Regulation referring to the International Carriage of Dangerous Goods by Rail (RID
International Maritime Dangerous Goods (IMDG)

EU Regulation (EC) No. 1907/2006 (REACH)
Annex XIV - List of substances subject to authorisation
Substances of very high concern (CMR): 1,2-Dichloropropane is not listed on Annex XIV and it’s not subject to authorization.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles
Restrictions on use: see Restriction 40 from Anex XVII (flammable substances)

Other EU regulations: 1,2 Dichloropropane is a SEVESO substance, not ozone depleting substance.
Water contaminating class WGK 3 slightly water endangering (Germany regulation)

15.2 Chemical safety Assessment Assessment
A chemical safety assessment has been carried out for this substance and a cSR was issued.
16. OTHER INFORMATION

16.1. Full text of H-Statements referred to under sections 2

H 225 Highly flammable liquid and vapour.
H 302 Harmful if swallowed.
H 332 Harmful if inhaled.
H 350: May cause cancer.

16.2. Full text of P-Statements referred to under sections 2

P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P241: Use explosion-proof electrical/ventilating/lighting/.../equipment.
P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

16.3. Explanations for possible abbreviations mentioned in above sections

CSA - Chemical Safety Assessment
CSR - Chemical Safety Report
PBT: Persistent, bioaccumulative and toxic.
vPvB: Very persistent and very bioaccumulative.
ES: Exposure Scenario
STEL: Short term exposure limit based
TWA: Time Weighted Average (TWA)
WGK: Wassergefährdungsklasse - Water hazard class, in Germany
DNEL: Derived No Effect Level
PNEC: Predicted No-Effect Concentration
NOAEL - No observed adverse effect level
NOAEC - No Observed Adverse Effects Concentration
LOAEC - Lowest Observable Adverse Effect Concentration
EC50 - concentration of toxic material for which 50% of the tested organisms survive
LD50 - lethal dose for 50% of the tested population
LC50 - lethal concentration for 50% of the tested population
UN - United Nations
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

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RID: International Carriage of Dangerous Goods by Road

16.4. Revision: Revision 4 replace revision dated May 25, 2015 and the TUV logo header was removed in accordance with accreditation body request.

Disclaimer:
Oltchim provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. The information is intended to aid the user in controlling the handling risks; it is not to be construed as a warranty or specification of the product quality. The information may not be or may not altogether be applicable to combinations of the product with other substances or to particular applications. The user is responsible for ensuring that appropriate precautions are taken and for satisfying themselves that the data are suitable and sufficient for the product's intended purpose. In case of any unclarity we advise consulting the supplier or an expert.

ANNEX I –EXPOSURE SCENARIO

9.1 Exposure Scenario 1: MANUFACTURING OF THE SUBSTANCE

<table>
<thead>
<tr>
<th>Sector of use:</th>
<th>Not relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market sector:</td>
<td>Not relevant</td>
</tr>
<tr>
<td>Environment:</td>
<td>Manufacturing process of the substance (ERC1)</td>
</tr>
<tr>
<td>Workers:</td>
<td>Use in closed process, no like hood of exposure (PROC1)</td>
</tr>
<tr>
<td></td>
<td>Transfer of substance from vessel to large containers at dedicated facilities (PROC8b)</td>
</tr>
</tbody>
</table>

9.1.1 Exposure Scenario
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Prepared in accordance with Annex II of the REACH regulation EC 1907/2006, and  
Regulation 453/2010

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Description of activities and processes covered in the exposure scenario:
1,2-Dichloropropane is produced as a co-product during the synthesis of propylene oxide via chlorohydrin process. After the process, the substance is purified by distillation and sent to storage facilities via dedicated pipelines. All the manufacturing stages are performed in closed systems. The exposure scenario includes monitoring activities of the process, transfer and maintenance operations.

9.1.1.1 Control of environmental exposure: Manufacturing process of the substance (ERC1)

Product characteristics
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: up to 100% w/w.

Amount manufactured
Annual amount manufactured per site: up to 22000 ton/y (at one site);
Percentage of tonnage manufactured at regional scale: 100%.

Frequency and duration of manufacturing
Production days per site: up to 360 day/y.

Other given operational conditions affecting environmental exposure
Process conditions: temperature not > 20°C above ambient temperature.

Technical onsite conditions and measures at process level to prevent release and to reduce or limit discharges, air emissions and releases to soil
Closed system (COSHH essentials Control Approach 3: Containment).
The substance is produced and handled under strictly controlled conditions: all process stages are performed in closed systems. The substance is rigorously contained by technical control measures during its whole production process, including purification, cleaning, maintenance of the equipment, sampling, analysis, loading and unloading of equipment, vessels, waste disposal and storage.
No wastewater and air emissions containing the substance arise from the process; wastes from distillation phase are sent to incineration plants.

Conditions and measures related to sewage treatment plant
No wastewater containing the substance arises from the process.

Conditions and measures related to treatment of waste
Wastes from distillation phase are incinerated at dedicated plants.

9.1.1.2 Control of workers exposure: Use in closed process, no likehood of exposure (PROC1)

Activities covered in the contributing exposure scenario
Monitoring activities during the manufacturing process; maintenance operations.

Product characteristics
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: up to 100% w/w.
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Frequency and duration of exposure:
Duration of exposure > 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: one hand face only (240 cm²) (Default ECETOC TRA model value)

Other given operational conditions affecting workers exposure:
Temperature not > 20°C above ambient temperature, Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Closed system (COSHH essentials Control Approach 3: Containment).
The substance is produced and handled under strictly controlled conditions: all process stages are performed in closed systems. The substance is rigorously contained by technical control measures during its whole production process, including purification, cleaning, maintenance of the equipment, sampling, analysis, loading and unloading of equipment, vessels, waste disposal and storage.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.
Only properly trained and authorized personnel handle the mixtures; handling procedures are well documented and strictly supervised by trained operators.
For cleaning and maintenance operations, special procedures such as purging and washing are applied before the system is opened.
In cases of accident and where wastes are generated, procedural and/or control technologies are used to minimize emissions and exposure of workers.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment are recommended: gloves, safety glasses, coveralls, safety shoes, helmet.
Gloves materials and specifications: in case of long-term contact Viton fluoroelastomer gloves (thickness: 0.3-0.71 mm; typical breakthrough time: 480 min) or PVA gloves (thickness: 0.3 mm; typical breakthrough time: 360 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping.

9.1.1.3 Control of workers exposure: Transfer of the substance from vessel to large containers at dedicated facilities (PROC8b)

Activities covered in the contributing exposure scenario: unloading/loading operations

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: ≤100% w/w.

Frequency and duration of exposure:
Duration of exposure >4 hr/day.
### Human factor not influenced by risk management:
Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value)

### Other given operational conditions affecting workers exposure:
Temperature not > 20°C above ambient temperature. Location: indoor; Industrial setting.

### Technical conditions and measures to control dispersion from source towards the workers:
COSHH essentials Control Approach 3: Containment (Reduction efficiency: 99%).
The substance is rigorously contained by technical control measures during its whole production process, including loading and unloading of equipment, vessels, waste disposal and storage. Transfer operations occurs via dedicated pipelines.

### Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.
Only properly trained and authorized personnel handle the mixtures; handling procedures are well documented and strictly supervised by trained operators.

### Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment are recommended: gloves, safety glasses, coveralls, safety shoes, helmet.
Gloves materials and specifications: in case of long term contact Viton fluoroelastomer gloves (thickness: 0.3-0.71 mm; typical breakthrough time: 480 min) or PVA gloves (thickness: 0.3 mm; typical breakthrough time: 360 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

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### 9.2 Exposure Scenario 2: FORMULATION

#### Sector of use:
Not relevant

#### Market sector:
- PC0 (UCN code: R10100): Degreasers;
- PC35: Washing and cleaning products;
- PC9a: Coatings and paints, thinners, paint removers;
9.2.1 Exposure Scenario

Description of activities and processes covered in the exposure scenario:
During the formulation stage, 1,2-Dichloropropane is mixed to other components to produce mainly industrial and professional preparations as degreasers/cleaning products and solvents/thinners for painting products/inks (ca. 70% w/w of the tonnage used for formulations); and, to a lesser extent, solvents for glues and adhesives, stain removers for fabric and paint removers.
In the final products, the content of 1,2-Dichloropropane can vary from 1-2% w/w, when it is used as denaturing additive for other solvents (e.g. alcohols, white spirit), to 90% w/w, when its main function is as solvent; the typical content of the substance in the formulated products is 40% w/w.
The exposure scenario includes monitoring activities of the process, transfer operations and maintenance.

9.2.1.1 Control of environmental exposure: *Formulation process (ERC 2)*

**Product characteristics**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical content in the final mixtures: up to 40% w/w.

**Amount used**
Annual amount used per site: up to 4500 ton/y (at the main site of use)
Fraction of the main site of use: 0.9

**Frequency and duration of process**
Production days per site: up to 240 day/y.

**Other given operational conditions affecting environmental exposure**
Process conditions: T = ambient temperature; P= 1 atm. Location: Indoor.

**Technical onsite conditions and measures at process level to prevent release and to reduce or limit discharges, air emissions and releases to soil**
The formulation process is arranged to maximize the efficiency of use of input raw materials, through the highest conversion into formulated products. Process losses are minimized, through the use of...
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- Use in closed batch process (PROC3)

Activities covered in the contributing exposure scenario:
Monitoring activities during the formulation process.

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the final mixture: up to 90% w/w.

Frequency and duration of exposure:
Duration of exposure: > 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: one hand face only (240 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.
Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source: the substance is mixed with the other components through computerized systems; the final mixtures are packaged by the use of automatic machines, in case of big batches, or using semi-automatic machines, for small batches.
General good ventilation.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes. Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluororubber gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.2.1.3 Control of workers exposure: Mixing or blending in batch process (PROC5)

Activities covered in the contributing exposure scenario:
Monitoring activities during the formulation process.

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the final mixture: up to 90% w/w.

Frequency and duration of exposure:
Duration of exposure: > 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed or semi-closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source.
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.
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Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.2.1.4 Control of workers exposure: Transfer of the substance/mixtures from/to vessel to/from large containers at dedicated facilities (PROC8b)

Activities covered in the contributing exposure scenario: loading and unloading to/from mixer

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the final mixture: up to 90% w/w.

Frequency and duration of exposure:
Duration of exposure: up to 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed or semi-closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
- use of closed production equipment, with no extraction, except when opening vessels for additions/sampling;
- use of semi-closed production vessels with extraction to atmosphere to maintain workplace airborne VOC concentrations below respective OELs.
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:

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**Personal protective equipment used:** gloves, safety glasses, coveralls, safety shoes.

Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).

(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).

Good hygiene practices and housekeeping.

### 9.2.1.5 Control of workers exposure: Transfer of the substance/mixtures into small containers (PROC9)

<table>
<thead>
<tr>
<th>Activities covered in the contributing exposure scenario:</th>
<th>unloading from mixer; sampling</th>
</tr>
</thead>
</table>

**Product characteristics:**

- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Concentration of substance in the final mixture: up to 90% w/w.

**Frequency and duration of exposure:**

- Duration of exposure: up to 4 hr/day.

**Human factor not influenced by risk management:**

- Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value)

**Other given operational conditions affecting workers exposure:**

- Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

**Technical conditions and measures to control dispersion from source towards the workers:**

- Process losses are minimized, through the use of closed or semi-closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
  - use of closed production equipment, with no extraction, except when opening vessels for additions/sampling;
  - use of semi-closed production vessels with extraction to atmosphere to maintain workplace airborne VOC concentrations below respective OELs.
- General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

**Organizational measures to prevent/limit releases, dispersion and exposure:**

- Regular training of workers and consequent supervision.

**Conditions and measures related to personal protection, hygiene and health evaluation:**

- Personal protective equipment used: gloves, safety glasses, coveralls, safety shoes.
- Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of

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mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.3 Exposure Scenario 3: USE OF FORMULATIONS - Industrial use

Sector of use:
SU3 (Industrial uses):
SU17: General manufacturing, (e.g. machinery, equipment, vehicles, other transport equipment);
SU15: Manufacture of fabricated metal products, except machinery and equipment,
SU18: Manufacture of furniture;
SU5: Manufacture of textiles, leather, fur;
SU7: Printing and reproduction of recorded media

Market sector:
PC0 (UCN code: R10100): Degreasers;
PC35: Washing and cleaning products;
PC9a: Coatings and paints, thinners, paint removers;
PC1: Adhesives, sealants;
PC18: Ink and toners

Environment:
Industrial use of processing aids in processes and products, not becoming part of articles (ERC4)

Workers:
Use in closed continuous process with occasional controlled exposure (PROC2)
Mixing or blending for formulation (PROC5)
Industrial spraying (PROC7)
Treatment of articles by dipping and pouring (PROC13)
Roller application or brushing (PROC10)
Transfer of the substance/mixtures from/to vessel to/from large containers at dedicated facilities (PROC8b)

9.3.1 Exposure Scenario
### Description of activities and processes covered in the exposure scenario:
Mixtures containing 1,2-dichloropropane are mainly used in the industry as degreasers/cleaning products and solvents/thinners for painting products/inks (ca. 70% w/w of the tonnage intended to industrial uses); and, to a lesser extent (ca. 30% w/w), as solvent in glues and adhesives products, stain removers for fabric and paint removers.
The exposure scenario includes transfer from storage, pouring/unloading from drums or containers, mixing/diluting in the preparatory phase, application by spraying, brushing, dipping and wiping, equipment cleaning and maintenance.

### 9.3.1.1 Control of environmental exposure: *Industrial use of processing aids in processes and products, not becoming part of articles (ERC 4)*

#### Product characteristics
- **Physical state of the substance:** liquid (medium volatility: 66.2 hPa at 25°C)
- **Typical concentration in the final mixtures:** 40% w/w

#### Amount used
- Annual amount used: up to 2700 ton/y;
- Annual amount used at the main local site of use: up to 1350 ton/y (EUSES default value for the fraction of the main local source: 0.5).

#### Frequency and duration of process
- Use days per site: 180 day/y (EUSES default value for number emission days at the main local site of use)

#### Other given operational conditions affecting environmental exposure
- **Process conditions:** T = ambient temperature; P= 1 atm. Location: Indoor; Industrial settings.

#### Technical onsite conditions and measures at process level to prevent release and to reduce or limit discharges, air emissions and releases to soil
The process should be optimized for highly efficient utilisation of the formulations. RMMs primarily are aimed at controlling emission of VOCs (Volatile Organic Compounds) to meet the relevant total emission limit value set out in the EU Solvent Emission Directive (1999/13/EC):
- use of closed storage facilities for VOC-containing raw materials;
- use of closed transfers of liquids from storage to equipment;
- use of closed application equipment
- use of closed equipment cleaning;
- storage of all VOC-containing wastes in closed, secure containers (bulk tanks, IBCs, drums).
Air emissions are treated by wet scrubber (RMM Library code: E12.02; efficiency: 70% (default), >99% (max achievable); thermal oxidation (RMM Library code: E12.12; efficiency: 98% (default), >99.9% (max achievable); adsorption (RMM Library code: E12.14); efficiency of adsorption: 80% (default value); 95% (max achievable).
Substance losses to wastewater are restricted to equipment cleaning or in the spray booth scrubber water.
No discharges of raw materials or products to soil occur. 
Overall efficiency of the total process, aimed to control emissions, is estimated as 80%.

**Organisational measures to prevent/limit release from site**
An environmental management system should be implemented.

**Conditions and measures related to sewage treatment plant**
Liquid wastes and wastewater are collected into dedicated containers for the recovery of the substance and the other organic solvents, through distillation. Not recoverable liquid wastes are sent to incineration.

**Conditions and measures related to treatment of waste**
Contaminated solid wastes are collected into containers and sent to external waste disposal facilities.

### 9.3.1.2 Control of workers exposure: Use in closed continuous process with occasional controlled exposure (PROC2)

**Activities covered in the contributing exposure scenario:**
Use of the formulations in closed continuous process

**Product characteristics:**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

**Frequency and duration of exposure:**
Duration of exposure: > 4 hr/day.

**Human factor not influenced by risk management:**
Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

**Other given operational conditions affecting workers exposure:**
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

**Technical conditions and measures to control dispersion from source towards the workers:**
Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

**Organizational measures to prevent/limit releases, dispersion and exposure:**
Regular training of workers and consequent supervision.

**Conditions and measures related to personal protection, hygiene and health evaluation:**
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical
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breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the
assessment: 20).
Good hygiene practices and housekeeping.

9.3.1.3 Control of workers exposure: Mixing or blending for formulation (PROC5)

Activities covered in the contributing exposure scenario:
Mixing/diluting in the preparatory phase

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

Frequency and duration of exposure:
Duration of exposure: up to 1 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code:
W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by
ECETOC TRA Worker model: 90%.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations,
fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of
mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough
time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical
breakthrough time: 10-30 min).
Half-mask respirator is recommended (APF factor of respiratory protection: 10) (Exposure
reduction factor of gloves in combination with specific activity training assumed in the assessment:
20).
Good hygiene practices and housekeeping.

9.3.1.4 Control of workers exposure: Industrial spraying (PROC7)

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process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It
remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this
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### Activities covered in the contributing exposure scenario:
Application of formulations by spraying

### Product characteristics:
- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Typical concentration in the final mixtures: 40% w/w

### Frequency and duration of exposure:
- Duration of exposure: > 4 hr/day.

### Human factor not influenced by risk management:
- Body parts potentially exposed: two hands and forearms (1500 cm²) (Default ECETOC TRA model value).

### Other given operational conditions affecting workers exposure:
- Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

### Technical conditions and measures to control dispersion from source towards the workers:
- Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
  - General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

### Organizational measures to prevent/limit releases, dispersion and exposure:
- Regular training of workers and consequent supervision.

### Conditions and measures related to personal protection, hygiene and health evaluation:
- Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
  - Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
  - Half-mask respirator is recommended (APF factor of respiratory protection: 20) (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
- Good hygiene practices and housekeeping.

### 9.3.1.5 Control of workers exposure: Treatment of articles by dipping and pouring (PROC13)

### Activities covered in the contributing exposure scenario:
Application of formulations by dipping

### Product characteristics:
- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Typical concentration in the final mixtures: 40% w/w
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Frequency and duration of exposure:
Duration of exposure: > 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
Half-mask respirator is recommended (APF factor of respiratory protection: 20) (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.3.1.6 Control of workers exposure: Roller application or brushing (PROC10)

Activities covered in the contributing exposure scenario:
Application of formulations by brush or roll

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

Frequency and duration of exposure:
Duration of exposure: up to 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Industrial setting.

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Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
Half-mask respirator is recommended (APF factor of respiratory protection: 20) (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.3.1.7 Control of workers exposure:  Transfer of the substance/mixtures from/to vessel to/from large containers at dedicated facilities or brushing (PROC8b)

Activities covered in the contributing exposure scenario: unloading from containers

Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

Frequency and duration of exposure:
Duration of exposure: up to 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value).

Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature, Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Process losses are minimized, through the use of closed equipment to minimize losses of VOCs (Volatile Organic Compounds). RMMs primarily are aimed at controlling emission of VOCs at source:
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by
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ECETOC TRA Worker model: 95%.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
Half-mask respirator is recommended (APF factor of respiratory protection: 10) (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

9.4 Exposure Scenario 4: USE OF FORMULATIONS - Professional use

Sector of use:
SU22 (Professional uses):
SU0 (NACE code: 45.2): Maintenance and repair of vehicles
SU0 (NACE code: C33): Repair and installation of machinery and equipment
SU15: Manufacture of fabricated metal products, except machinery and equipment
SU18: Manufacture of furniture
SU5: Manufacture of textiles, leather, fur
SU0: Laundries
SU7: Printing and reproduction of recorded media

Market sector:
PC0 (UCN code: R10100): Degreasers
PC35: Washing and cleaning products;
PC9a: Coatings and paints, thinners, paint removers;
PC1: Adhesives, sealants;
PC18: Ink and toners

Environment:
Wide dispersive indoor use of processing aids in open system (ERC8a)
Wide dispersive outdoor use of processing aids in open system (ERC8d)

Workers:

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Use in batch and other process where opportunity for exposure arises (PROC4)
Mixing or blending for formulation (PROC5)
Non-industrial spraying (PROC11)
Treatment of articles by dipping and pouring (PROC13)
Roller application or brushing (PROC10)
Hand-mixing with intimate contact and only PPE available (PROC19)
Transfer of the substance/mixtures from/to vessel to/from large containers at non-dedicated facilities (PROC8a)

### 9.4.1 Exposure Scenario

**Description of activities and processes covered in the exposure scenario:**
Mixtures containing 1,2-dichloropropane are used by professional workers as degreasers/cleaning products and solvents/thinners for painting products/inks; and, to a lesser extent, as solvent in glues and adhesives, stain removers for fabric and paint removers.
The exposure scenario includes transfer from storage, pouring/unloading from drums or containers, mixing/diluting in the preparatory phase, application by spraying, brushing, dipping and wiping, equipment cleaning and maintenance.

**9.4.1.1 Control of environmental exposure:** *Wide dispersive indoor/outdoor use of processing aids in open system (ERC 8a/8d)*

**Product characteristics**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration of substance in the final mixtures: 40% w/w

**Amount used**
Annual amount used: up to 2050 ton/y;
Annual amount used at the main local site of use: up to 5 ton/y (EUSES default value for the fraction of the main local source: 0.002).

**Frequency and duration of process**
Use days per site: 300 day/y (EUSES default value for number emission days)

**Environment factors not influences by risk management**
Flow rate of receiving surface water (m³/d): 18000 (default value for the standard town)

**Other given operational conditions affecting environmental exposure**
Process conditions: T = ambient temperature; P= 1 atm. Location: Indoor/Outdoor;

**Technical onsite conditions and measures at process level to prevent release and to reduce or limit discharges, air emissions and releases to soil**
The process should be optimized for highly efficient utilisation of the formulations.
The activities falling under the EU Solvent Emission Directive (1999/13/EC) adopt RMMs to control emission of VOCs (Volatile Organic Compounds) to meet the relevant total emission limit

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value set out in the Directive:
- use of closed storage facilities for VOC-containing raw materials;
- use of closed transfers of liquids from storage to equipment;
- use of closed application equipment
- use of closed equipment cleaning;
- storage of all VOC-containing wastes in closed, secure containers (bulk tanks, IBCs, drums).

### Organisational measures to prevent/limit release from site

Good hygiene practices and housekeeping. An environmental management system should be implemented.

### Conditions and measures related to sewage treatment plant

Losses to sewers are treated in the municipal STP.
Size of municipal STP is 2000 m³/d (default size).

### Conditions and measures related to treatment of waste

Contaminated solid wastes are collected into containers and sent to external waste disposal facilities.

### 9.4.1.2 Control of workers exposure: Use in batch and other process where opportunity for exposure arises (PROC4)

#### Activities covered in the contributing exposure scenario:
Use of the formulations in batch processes

#### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

#### Frequency and duration of exposure:
Duration of exposure: > 4 hr/day.

#### Human factor not influenced by risk management:
Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

#### Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Professional settings.

#### Technical conditions and measures to control dispersion from source towards the workers:
RMMs primarily are aimed at controlling emission of VOCs at source.
General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.

#### Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

#### Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of
mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).

Half-mask respirator is recommended (APF factor of respiratory protection: 10). (Exposure reduction factor of gloves: 10).

Good hygiene practices and housekeeping.

### 9.4.1.3 Control of workers exposure: Mixing or blending for formulation (PROC5)

#### Activities covered in the contributing exposure scenario:
Mixing/diluting in the preparatory phase

#### Product characteristics:
- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Typical concentration in the final mixtures: 40% w/w

#### Frequency and duration of exposure:
- Duration of exposure: up to 1 hr/day.

#### Human factor not influenced by risk management:
- Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

#### Other given operational conditions affecting workers exposure:
- Operational conditions: T= ambient temperature. Location: indoor; Professional settings.

#### Technical conditions and measures to control dispersion from source towards the workers:
RMMs primarily are aimed at controlling emission of VOCs at source.

General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.

#### Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

#### Conditions and measures related to personal protection, hygiene and health evaluation:
- Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.
- Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
- Half-mask respirator is recommended (APF factor of respiratory protection: 10). (Exposure reduction factor of gloves: 10).
- Good hygiene practices and housekeeping.

### 9.4.1.4 Control of workers exposure: Non – industrial spraying (PROC11)
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### Activities covered in the contributing exposure scenario:
Application of formulation by spraying

### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

### Frequency and duration of exposure:
Duration of exposure: up to 4 hr/day.

### Human factor not influenced by risk management:
Body parts potentially exposed: two hands and forearms (1500 cm²)

### Other given operational conditions affecting workers exposure:
Operational conditions: T= ambient temperature. Location: indoor; Professional settings.

### Technical conditions and measures to control dispersion from source towards the workers:
RMMs primarily are aimed at controlling emission of VOCs at source. Application by spraying is performed in dedicated spray booths connected to an aspiration system. General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed for assessment: 90%

### Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.

### Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment: gloves, safety glasses, coveralls, safety shoes. 
Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
Half-mask respirator is recommended (APF factor of respiratory protection: 20) . (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.

### 9.4.1.5 Control of workers exposure: Treatment of articles by dipping and pouring (PROC13)

### Activities covered in the contributing exposure scenario:
Application of formulation by dipping

### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration in the final mixtures: 40% w/w

### Frequency and duration of exposure:
Duration of exposure: up to 4 hr/day.

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### Human factor not influenced by risk management:

Body parts potentially exposed: two hands face (480 cm²) (Default ECETOC TRA model value).

### Other given operational conditions affecting workers exposure:

Operational conditions: T= ambient temperature. Location: indoor; Professional settings.

### Technical conditions and measures to control dispersion from source towards the workers:

RMMs primarily are aimed at controlling emission of VOCs at source. Degreasing and cleaning of equipments and parts of them are performed through automated/semi-automated washing machines, connected to an aspiration system.

General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.

### Organizational measures to prevent/limit releases, dispersion and exposure:

Regular training of workers and consequent supervision.

### Conditions and measures related to personal protection, hygiene and health evaluation:

Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.

Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).

Half-mask respirator is recommended (APF factor of respiratory protection: 20) . (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).

Good hygiene practices and housekeeping.

### 9.4.1.6 Control of workers exposure: Roller application or brushing (PROC10)

### Activities covered in the contributing exposure scenario:

Application of formulation by brush or roll

### Product characteristics:

Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)

Typical concentration in the final mixtures: 40% w/w

### Frequency and duration of exposure:

Duration of exposure: up to 4 hr/day.

### Human factor not influenced by risk management:

Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value).

### Other given operational conditions affecting workers exposure:

Operational conditions: T= ambient temperature. Location: indoor; Professional settings.

### Technical conditions and measures to control dispersion from source towards the workers:

RMMs primarily are aimed at controlling emission of VOCs at source.
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<table>
<thead>
<tr>
<th>General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational measures to prevent/limit releases, dispersion and exposure:</strong></td>
</tr>
<tr>
<td>Regular training of workers and consequent supervision.</td>
</tr>
<tr>
<td>Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: &gt; 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).</td>
</tr>
<tr>
<td>Good hygiene practices and housekeeping.</td>
</tr>
</tbody>
</table>

### 9.4.1.7 Control of workers exposure: *Hand-mixing with intimate contact and only PPE available (PROC19)*

<table>
<thead>
<tr>
<th>Activities covered in the contributing exposure scenario:</th>
<th><strong>Product characteristics:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual mixing of small quantities of formulations</td>
<td>Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)</td>
</tr>
<tr>
<td>Typical concentration in the final mixtures: 40% w/w. Due to the small quantities manually mixed, a concentration as 5-25% was considered.</td>
<td>Typical concentration in the final mixtures: 40% w/w. Due to the small quantities manually mixed, a concentration as 5-25% was considered.</td>
</tr>
<tr>
<td>Frequency and duration of exposure:</td>
<td>Frequency and duration of exposure: up to 1 hr/day.</td>
</tr>
<tr>
<td>Duration of exposure: up to 1 hr/day.</td>
<td>Human factor not influenced by risk management:</td>
</tr>
<tr>
<td>Body parts potentially exposed: two hands (1980 cm²) (Default ECETOC TRA model value).</td>
<td>Body parts potentially exposed: two hands (1980 cm²) (Default ECETOC TRA model value).</td>
</tr>
<tr>
<td>Other given operational conditions affecting workers exposure:</td>
<td><strong>Technical conditions and measures to control dispersion from source towards the workers:</strong></td>
</tr>
<tr>
<td>Operational conditions: T= ambient temperature. Location: indoor; Professional settings.</td>
<td>General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.</td>
</tr>
<tr>
<td></td>
<td>Organizational measures to prevent/limit releases, dispersion and exposure:</td>
</tr>
<tr>
<td>Regular training of workers and consequent supervision.</td>
<td>Organizational measures to prevent/limit releases, dispersion and exposure:</td>
</tr>
<tr>
<td>Regular training of workers and consequent supervision.</td>
<td>Conditions and measures related to personal protection, hygiene and health evaluation:</td>
</tr>
<tr>
<td>Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.</td>
<td>Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.</td>
</tr>
</tbody>
</table>

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</table>

Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: > 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).

Half-mask respirator is recommended (APF factor of respiratory protection: 10). (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).

Good hygiene practices and housekeeping.

### 9.4.1.8 Control of workers exposure: Transfer of the substance/mixtures from/to vessel to/from large containers at non-dedicated facilities (PROC8a)

<table>
<thead>
<tr>
<th>Activities covered in the contributing exposure scenario:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading/unloading operations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)</td>
</tr>
<tr>
<td>Typical concentration in the final mixtures: 40% w/w</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency and duration of exposure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of exposure: up to 1 hr/day.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human factor not influenced by risk management:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other given operational conditions affecting workers exposure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational conditions: T= ambient temperature. Location: indoor; Professional settings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical conditions and measures to control dispersion from source towards the workers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMMs primarily are aimed at controlling emission of VOCs at source. General good ventilation and LEV should be provided. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 80%.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organizational measures to prevent/limit releases, dispersion and exposure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular training of workers and consequent supervision.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions and measures related to personal protection, hygiene and health evaluation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal protective equipment: gloves, safety glasses, coveralls, safety shoes.</td>
</tr>
<tr>
<td>Gloves materials and specifications: in case of long-term contact and mixtures at high concentrations, fluoroelastomer gloves (thickness: 0.5-1.5 mm; typical breakthrough time: &gt; 240 min); in case of mixtures at low-medium concentrations, neoprene gloves (thickness: 0.75 mm; typical breakthrough time: 60-120 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).</td>
</tr>
<tr>
<td>Half-mask respirator is recommended (APF factor of respiratory protection: 20). (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment:</td>
</tr>
</tbody>
</table>

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9.5 Exposure Scenario 5: USE OF FORMULATIONS - Consumer use

**Sector of use:**
SU21 (Consumers uses)

**Market sector:**
PC0 (UCN code: R10100): Degreasers
PC35: Washing and cleaning products;
PC9a: Coatings and paints, thinners, paint removers;
PC1: Adhesives, sealants

**Environment:**
Wide dispersive indoor use of processing aids in open system (ERC8a)
Wide dispersive outdoor use of processing aids in open system (ERC8d)

**9.5.1 Exposure Scenario**

**Description of activities covered in the exposure scenario:**
Mixtures containing 1,2-dichloropropane are used by consumers as degreasers/cleaning products and solvents/thinners for painting products; and, to a lesser extent, as solvent in glues and adhesives, stain removers for fabric and paint removers.
The exposure scenario includes mixing/diluting in the preparatory phase, application by brush or cloth and by spraying.

**9.5.1.1 Control of environmental exposure:** *Wide dispersive indoor/outdoor use of processing aids in open system (ERC 8a/8d)*

**Product characteristics**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Typical concentration of substance in the final mixtures: 40% w/w

**Amount used**
Annual amount used: up to 250 ton/y;
Annual amount used at the main local site of use: up to 0.5 ton/y (EUSES default value for the fraction of the main local source: 0.002).

**Frequency and duration of process**
Use days per site: 365 day/y (EUSES default value for number emission days)

**Environment factors not influences by risk management**

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Good hygiene practices and housekeeping.
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</table>

Flow rate of receiving surface water (m³/d): 18000 (default value for the standard town)

### Other given operational conditions affecting environmental exposure

- **Process conditions:** T = ambient temperature; P= 1 atm. Location: Indoor/Outdoor;
- **Conditions and measures related to sewage treatment plant**
  - Losses to sewers are treated in the municipal STP.
  - Size of municipal STP is 2000 m³/d (default size).
- **Conditions and measures related to treatment of waste**
  - Contaminated solid wastes should be collected into dedicated containers for urban waste.

### 9.5.1.2 Control of consumers exposure: Use of degreasers (UCN code R10100)

#### Product characteristics:
- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Typical concentration of substance in the mixtures: <40% w/w

#### Amount product used per application:
- 100 ml/event (90 g/event; typical product density: 0.9 g/ml)

#### Frequency of exposure:
- Infrequent use (between once a month and once every 6 month).
- ECETOC TRA default factor for infrequent use: 0.04

#### Duration of exposure:
- Exposure time: 1 hr

#### Human factor not influenced by risk management:
- Body parts potentially exposed: fingertips (35.7 cm²)

#### Other given operational conditions affecting consumers exposure:
- Application by brush or cloth.
- Location: outdoor (air exchanges per hour: 2.5; room volume: 100 m³); indoor with good home ventilation (air exchanges per hour: 6; room volume: 20 m³).

#### Conditions and measures related to information and behavioural advice to consumers:
- Instruction for safe handling (e.g. Keep in a cool, well-ventilated place; Keep away from sources of ignition; Use only in a well-ventilated place; Avoid contact with skin and eyes; Do not empty into drains) are communicated on the label and in the instruction of use or in the leaflet available to consumers.

### 9.5.1.3 Control of consumers exposure: Use of solvent/thinner for painting products (PC9a)

#### Product characteristics:
- Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
- Typical concentration of substance in the final mixtures, after dilution: <8% w/w

#### Amount product used per application:
- 1300 g/event for application by brush; 300 g/event for application by spraying

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### Frequency of exposure:
Infrequent use (between once a month and once every 6 months). ECETOC TRA default factor for Infrequent use: 0.04

### Duration of exposure:
Exposure time: 2 hr for application by brush; 20 minutes for application by spraying

### Human factor not influenced by risk management:
Body parts potentially exposed: inside hands / one hand / palm of hands (428.75 cm²) for application by brush; fingertips (35.7 cm²) for application by spraying

### Other given operational conditions affecting consumers exposure:
Application by brush or spray can.  
Location: outdoor (air exchanges per hour: 2.5; room volume: 100 m³)

### Conditions and measures related to information and behavioural advice to consumers:
Instruction for safe handling (e.g. Keep in a cool, well-ventilated place; Keep away from sources of ignition; Use only in a well-ventilated place; Avoid contact with skin and eyes; Do not empty into drains) are communicated on the label and in the instruction of use or in the leaflet available to consumers.

### 9.5.1.4 Control of consumers exposure: Use of glues and adhesives (PC1)

### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)  
Typical concentration of substance in the final mixtures, after dilution: < 8% w/w

### Amount product used per application:
9 g/event

### Frequency of exposure:
Occasional use (between once a week and once a month). ECETOC TRA default factor for Infrequent use: 0.2

### Duration of exposure:
Exposure time: 20 minutes

### Human factor not influenced by risk management:
Body parts potentially exposed: fingertips (35.7 cm²)

### Other given operational conditions affecting consumers exposure:
Location: indoor (air exchanges per hour: 0.6; room volume: 20 m³).

### Conditions and measures related to information and behavioural advice to consumers:
Instruction for safe handling (e.g. Keep in a cool, well-ventilated place; Keep away from sources of ignition; Use only in a well-ventilated place; Avoid contact with skin and eyes; Do not empty into drains) are communicated on the label and in the instruction of use or in the leaflet available to consumers.

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## 9.5.1.5 Control of consumers exposure: Use of stain removers for fabric (PC35)

### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the final mixture: < 15% w/w

### Amount product used per application:
5 g/event

### Frequency of exposure:
Infrequent use (between once a month and once every 6 month). ECETOC TRA default factor for Infrequent use: 0.04

### Duration of exposure:
Exposure time: 20 minutes

### Human factor not influenced by risk management:
Body parts potentially exposed: fingertips (35.7 cm²)

### Other given operational conditions affecting consumers exposure:
Location: indoor (air exchanges per hour: 0.6; room volume: 20 m³).

### Conditions and measures related to information and behavioural advice to consumers:
Instruction for safe handling (e.g. Keep in a cool, well-ventilated place; Keep away from sources of ignition; Use only in a well-ventilated place; Avoid contact with skin and eyes; Do not empty into drains) are communicated on the label and in the instruction of use or in the leaflet available to consumers.

## 9.5.1.6 Control of consumers exposure: Use of paint removers (PC9a)

### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the final mixture: < 90% w/w

### Amount product used per application:
250 g/event

### Fraction of the product released during the application:
An inhalation transfer fraction as 0.8 is considered. Paint removers are viscous liquids or gels formulations with slow evaporation rate. These products are applied on the surfaces to treat, left to work for about 20 minutes and removed.

### Frequency of exposure:
Very infrequent (no more than once in 6 month). ECETOC TRA default factor for Infrequent use: 0.01

### Duration of exposure:
Exposure time: 1 hr

### Human factor not influenced by risk management:
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Body parts potentially exposed: fingertips (35.7 cm²)

Other given operational conditions affecting consumers exposure:
Application by brush.
Location: outdoor (air exchanges per hour: 2.5; room volume: 100 m³); indoor with good home ventilation (air exchanges per hour: 6; room volume: 20 m³).

Conditions and measures related to information and behavioural advice to consumers:
Instruction for safe handling (e.g. Keep in a cool, well-ventilated place; Keep away from sources of ignition; Use only in a well-ventilated place; Avoid contact with skin and eyes; Do not empty into drains) are communicated on the label and in the instruction of use or in the leaflet available to consumers.

Conditions and measures related to personal protection, hygiene and health evaluation:
Protective gloves (e.g. nitrile rubber gloves) are recommended.

9.6 Exposure Scenario 6: USE AS INTERMEDIATE

Sector of use:
SU3 (Industrial use):
SU8: Manufacture of bulk, large scale chemicals
SU9: Manufacture of fine chemicals

Market sector:
PC19: Intermediate

Environment:
Industrial use resulting in manufacture of another substance (ERC6a)

Workers:
Use in closed process, no likelihood of exposure (PROC1)
Use in closed, continuous process with occasional controlled exposure (PROC2)
Transfer of substance from vessel to large containers at dedicated facilities (PROC8b)

9.6.1 Exposure Scenario

Description of activities and processes covered in the exposure scenario:
1,2-Dichloropropane is used as an intermediate to produce perchloroethylene and several other related chlorinated chemicals. All the process stages are performed in closed systems. The exposure scenario includes monitoring activities of the process, transfer and maintenance operations.

9.6.1.1 Control of environmental exposure: Industrial use resulting in manufacture of another substance (ERC6a)

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**Product characteristics**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: up to 100% w/w.

**Amount used**
Annual amount used: 10 ton/y
Annual amount used per site: up to 6.5 ton/y (EUSES default value for the fraction of the main local source: 0.65).

**Frequency and duration of manufacturing**
Production days per site: 240 day/y. (EUSES default value for emission days)

**Other given operational conditions affecting environmental exposure**
Process conditions: temperature not > 20°C above ambient temperature; Location: Indoor; Industrial settings.

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**
Closed system (COSHH essentials Control Approach 3: Containment).
The substance is used and handled under strictly controlled conditions: all process stages are performed in closed systems. The substance is rigorously contained by technical control measures during its whole use process, including purification, cleaning, maintenance of the equipment, sampling, analysis, loading and unloading of equipment, vessels, waste disposal and storage.
No wastewater and air emissions containing the substance arise from the process; wastes from distillation phase are sent to incineration plants.

**Conditions and measures related to sewage treatment plant**
No wastewater containing the substance arises from the process.

**Conditions and measures related to treatment of waste**
Wastes from distillation phase are incinerated at dedicated plants.

**9.6.1.2 Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1)**

**Activities covered in the contributing exposure scenario**
Monitoring activities during the use process; maintenance operations.

**Product characteristics**
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: up to 100% w/w.

**Frequency and duration of exposure:**
Duration of exposure > 4 hr/day.

**Human factor not influenced by risk management:**
Body parts potentially exposed: one hand face only (240 cm²) (Default ECETOC TRA model value)

**Other given operational conditions affecting workers exposure:**
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Temperature not > 20°C above ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Closed system (COSHH essentials Control Approach 3: Containment).
The substance is handled under strictly controlled conditions: all process stages are performed in
closed systems. The substance is rigorously contained by technical control measures during its whole
use process, including purification, cleaning, maintenance of the equipment, sampling, analysis,
loading and unloading of equipment, vessels, waste disposal and storage.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.
Only properly trained and authorized personnel handle the mixtures; handling procedures are well
documented and strictly supervised by trained operators.
For cleaning and maintenance operations, special procedures such as purging and washing are
applied before the system is opened.
In cases of accident and where wastes are generated, procedural and/or control technologies are
used to minimize emissions and exposure of workers.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment are recommended: gloves, safety glasses, coveralls, safety shoes,
helmet.
Gloves materials and specifications: Viton fluoroelastomer gloves (thickness: 0.3-0.71 mm; typical
breakthrough time: 480 min) or PVA gloves (thickness: 0.3 mm; typical breakthrough time: 360
min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough
time: 10-30 min). (Exposure reduction factor of gloves in combination with specific activity training
assumed in the assessment: 20). Good hygiene practices and housekeeping.

9.6.1.3 Control of worker exposure: Use in closed, continuous process with occasional
controlled exposure (PROC2)

Activities covered in the contributing exposure scenario
Monitoring activities during the use process; maintenance operations.

Product characteristics
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: up to 100% w/w.

Frequency and duration of exposure:
Duration of exposure > 4 hr/day.

Human factor not influenced by risk management:
Body parts potentially exposed: one hand face only (240 cm²) (Default ECETOC TRA model value)

Other given operational conditions affecting workers exposure:
Temperature not > 20°C above ambient temperature. Location: indoor; Industrial setting.

Technical conditions and measures to control dispersion from source towards the workers:
Closed system (COSHH essentials Control Approach 3: Containment).

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product.
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The substance is handled under strictly controlled conditions: all process stages are performed in closed systems. The substance is rigorously contained by technical control measures during its whole use process, including purification, cleaning, maintenance of the equipment, sampling, analysis, loading and unloading of equipment, vessels, waste disposal and storage.

### Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision.
Only properly trained and authorized personnel handle the mixtures; handling procedures are well documented and strictly supervised by trained operators.
For cleaning and maintenance operations, special procedures such as purging and washing are applied before the system is opened.
In cases of accident and where wastes are generated, procedural and/or control technologies are used to minimize emissions and exposure of workers.

### Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment are recommended: gloves, safety glasses, coveralls, safety shoes, helmet.
Gloves materials and specifications: Viton fluoroelastomer gloves (thickness: 0.3-0.71 mm; typical breakthrough time: 480 min) or PVA gloves (thickness: 0.3 mm; typical breakthrough time: 360 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping.

### 9.6.1.4 Control of workers exposure: Transfer of the substance from vessel to large containers at dedicated facilities (PROC8b)
Activities covered in the contributing exposure scenario: unloading/loading operations

#### Product characteristics:
Physical state of the substance: liquid (medium volatility: 66.2 hPa at 25°C)
Concentration of substance in the manufactured product: ≤100% w/w.

#### Frequency and duration of exposure:
Duration of exposure >4 hr/day.

#### Human factor not influenced by risk management:
Body parts potentially exposed: two hands (960 cm²) (Default ECETOC TRA model value)

#### Other given operational conditions affecting workers exposure:
Temperature not > 20°C above ambient temperature, Location: indoor; Industrial setting.

#### Technical conditions and measures to control dispersion from source towards the workers:
COSHH essentials Control Approach 3: Containment (Reduction efficiency: 99%).
The substance is rigorously contained by technical control measures during its whole production process, including loading and unloading of equipment, vessels, waste disposal and storage. Transfer operations occurs via dedicated pipelines.
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**Organizational measures to prevent/limit releases, dispersion and exposure:**
Regular training of workers and consequent supervision.
Only properly trained and authorized personnel handle the mixtures; handling procedures are well documented and strictly supervised by trained operators.

**Conditions and measures related to personal protection, hygiene and health evaluation:**
Personal protective equipment are recommended: gloves, safety glasses, coveralls, safety shoes, helmet
Gloves materials and specifications: Viton fluoroelastomer gloves (thickness: 0.3-0.71 mm; typical breakthrough time: 480 min) or PVA gloves (thickness: 0.3 mm; typical breakthrough time: 360 min); in case of short-term contact, nitrile gloves (thickness: 0.2-0.38 mm; typical breakthrough time: 10-30 min).
(Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20).
Good hygiene practices and housekeeping.